POWERS

SQUARES OF INTEGERS

PICK AND MIX

[CALCULATOR ALLOWED]

Ref: G1C1. **1E1**

A1 What digits can a square number end with?	**A2** Find three square numbers which add together to make 142	**A3** Which two **consecutive** square numbers have a difference of 17	**A4** Two **different** square numbers are added together to make an even number between 50 and 100. How many ways are there to do this?
B1 Split the numbers below into three groups so that each group adds up to a different square number: 2, 2, 3, 3, 3, 3, 4, 4, 5, 5, 5, 6	**B2** All square numbers greater than one can be made by adding two prime numbers. Is this true? Convince me!	**B3** What remainders are possible when you divide a square number by 4?	**B4** Square an odd number then subtract 1. Can you find any patterns?
C1 a, b, c, d, e are consecutive integers such that $a^2+b^2+c^2=d^2+e^2$ Find a, b, c, d, and e	**C2** What is the smallest number, n, such that n^2 is divisible by a square number greater than 4.	**C3** People born in 1980 will be n years old in the year n^2. Find the value of n.	**C4** Three **different** square numbers, **greater than 10**, are added together to make an odd number between 100 and 150. How many ways are there to do this?
D1 a, b, c, d, e are consecutive integers such that $(a+b+c)^2=(d+e)^2$ Find a, b, c, d, and e	**D2** The product of two square numbers always equals a square number. Is this true? Convince me!	**D3** When I square an odd number, the answer is always odd. Is this true? Convince me!	**D4** What three-digit square numbers are also square numbers when their digits are reversed?

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A spreadsheet is very useful to investigate or solve some of these problems

A1 What digits can a square number end with? 0, 1, 4, 5, 6 or 9	**A2** Find three square numbers which add together to make 142 25 + 36 + 81	**A3** Which two **consecutive** square numbers have a difference of 17 81 and 64	**A4** 1+49 9+49 16+64 1+81 9+81 25+49 4+64 16+36 36+64
B1 Split the numbers below into three groups so that each group adds up to a different square number: (2, 2) (3, 3, 3, 3, 4) … (4, 5, 5, 5, 6)	**B2** Flase - only way to get an odd square number is if one of the prime numbers is 2. So 121 would have to be 2 + 119, but 119 is not prime!	**B3** What remainders are possible when you divide a square number by 4? 0 or 1	**B4** Square an odd number then subtract 1. Can you find any patterns? You always get a multiple of eight.
C1 a, b, c, d, e are consecutive integers such that $a^2+b^2+c^2=d^2+e^2$ Find a, b, c, d, and e $10^2 + 11^2 + 12^2 = 13^2 + 14^2$	**C2** What is the smallest number, n, such that n^2 is divisible by a square number greater than 4. 3 because 3^2 is divisible by 9	**C3** People born in 1980 will be n years old in the year n^2. Find the value of n. n = 45 because $45^2 = 2025$	**C4** 16+25+64 16+49+64 16+25+100 25+36+64 16+36+49 36+49+64 16+36+81
D1 a, b, c, d, e are consecutive integers such that $(a+b+c)^2=(d+e)^2$ Find a, b, c, d, and e $(4 + 5 + 6)^2 = (7 + 8)^2$	**D2** True - if the two square numbers were a^2 and b^2 $a^2 \times b^2 = a \times a \times b \times b$ $= a \times b \times a \times b$ $= (a \times b)^2$	**D3** True - let n be even. This means that n+1 is odd $(n+1)^2 = n^2 + 2n + 1$ The +1 at then end means the answer is odd!	**D4** 121 144 and 441 169 and 961 484 676